K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:PG-II	Program:MBA
Branch Code:10	Pattern:2024
Name of Course:Lean Six Sigma	Course Code:2410614D
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains __3___page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.
6. Q1 & Q2 are compulsory and Choose (a) or (b) and (c) or (d) from Q3,Q4 and Q5.

		Marks	**CO**
Question No. 1			
1a)	Apply the DMAIC methodology to improve a process with high defect rates in a manufacturing organization.	(6)	CO1
Question No. 2			
2a)	A team has a DPMO of **20,000**. They inspect **2,000 units**, with each unit having **4 opportunities**.Calculate how many total defects occurred?	(6)	CO2
Question No. 3			
3a)	What is Process Capability Index?A machining process produces shafts with a **specification limit** of:**LSL= 48 mm, USL = 52 mm.**From process data, the following statistics are obtained:**Process mean (μ) = 50.5 mm.Process standard deviation (σ) = 0.5 mm.**Calculate Cp, Cpk and Comment on the process capability and centering.	(8)	CO3
	OR		
3b)	What is Process Capability Index?A machining process produces shafts with a **specification limit** of: **LSL= 95 mm, USL = 105 mm.**From process data, the following statistics are obtained:**Process mean (μ) = 102 mm.Process standard deviation (σ) = 1.5 mm.**Calculate Cp, Cpk and Comment on the process capability.	(8)	CO3
3c)	Analyse and write in detail the key steps in Process Analysis.	(8)	CO3
	OR		
3d)	Analyse the given below tools used in process analysis with a diagram and example.	(8)	CO3
Question No. 4			
4a)	A teacher wants to check whether **different teaching methods** affect students' **test scores**.**Method 1:**Lecture,**Method 2:** Group discussion,**Method 3:** Online learning.The teacher tests **4 students per method** after a month.Apply ANOVA to interpret the results. Given value of alpha is 0.05	(8)	CO4

Method	Student 1	Student 2	Student 3	Student 4
Lecture	70	75	72	68
Group Discussion	78	82	85	80
Online Learning	88	85	90	92

OR

4b) A teacher wants to check the effectiveness of three study methods on test scores.Apply ANOVA to interpret the results.Given value of alpha is 0.05. (8) CO4

Group	Scores
Group A(flashcards)	70,75,80
Group B(Videos)	85,90,88
Group C(Textbooks)	72,78,74

4c) A machine fills sugar packets with a claimed mean of 500 g.The population standard deviation is known to be 8 g.A sample of 40 packets has a mean weight of 497.5 g.Test at **5% significance** if the machine is underfilling..(Zcritical from table is -1.645). (8) CO4

OR

4d) A sample of 16 batteries has mean life 40 hours and standard deviation 6 hours.Test at 1% significance whether the population mean life is **different from 44 hours**..(value of t critical from table is + and -2.947) (8) CO4

Question No. 5

5a) **Evaluate** the effectiveness of $\bar{X}$–R charts versus p-charts in monitoring a manufacturing process, and justify which is better under different circumstances. (8) CO5

OR

5b) Compare and Evaluate the effectiveness of different types of control charts ($\bar{X}$–R, p-chart, c-chart) in reducing defects in a production environment. (8) CO5

5c) A process manufactures bolts. Every hour, a **sample of 4 bolts** is taken and their **lengths (mm)** are measured. SPC Constants (for sample size n = 4)**$A_2 = 0.729, D_3 = 0$ $D_4 = 2.282$.Apply SPC to find if the process is under control.** (8) CO5

Sample	Measurements (mm)
1	50, 51, 49, 50
2	50, 50, 51, 49
3	51, 50, 50, 51
4	49, 50, 50, 49

OR

5d) A process produces shafts. Every hour, a **sample of 4 shafts** is taken and their **diameters (mm)** are measured. SPC Constants (for sample size n = 4)**$A_2 = 0.729, D_3 = 0$, $D_4 = 2.282$.Apply SPC to find if the process is under control** (8) CO5

Sample	Measurements (mm)
1	20, 21, 19, 20
2	20, 20, 21, 19
3	21, 20, 20, 21
4	19, 20, 20, 19

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